

# Fine Particle (PM<sub>2.5</sub>) Trends in the Tennessee Valley

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## Poster Summary

Spatial and temporal variation in Tennessee Valley fine particle (PM<sub>2.5</sub>) levels are examined by piecing together the results of several disparate monitoring efforts. Given the regional concerns about the sources and impacts of secondary pollutants, the Environmental Protection Agency (EPA), Tennessee Valley Authority (TVA), Harvard University and the Valley environmental regulatory community have long been interested in fine particle air pollution. Early PM<sub>2.5</sub> monitoring efforts were initiated in the Great Smoky Mountains National Park in September 1978 followed by the Harvard University Six-City Study in Kingston/Harriman TN from 1980-85. These early studies paved the way for later fine-particle monitoring efforts by TVA (1981-1991), Harvard (1988-95), and TVA and Valley regulatory community (1997-present) to further refine our appreciation for, and understanding of, fine particle air pollution.

Beginning in 1982, the Tennessee Valley Authority (TVA) collected fourteen station-years of PM<sub>2.5</sub> and coarse (PM<sub>2.5</sub> to PM<sub>10</sub>) PM dichotomous sampler data at eight monitoring stations. These stations represented a cross-section of locations ranging from an urban/industrialized area of Chattanooga, TN, to a remote rural site on the west end of the Great Smoky Mountains National Park. Annual average concentrations of PM<sub>2.5</sub> exceeded the concentration of the annual PM<sub>2.5</sub> particulate matter National Ambient Air Quality Standard (NAAQS) of 15 µg/m<sup>3</sup> at five of the eight monitoring stations during six of fourteen station-years. Only a single value (out of 861 measurements) exceeded the 24-hour NAAQS PM<sub>2.5</sub> metric of 65 µg/m<sup>3</sup>. The regional PM<sub>2.5</sub>/PM<sub>10</sub> ratio based on the dichotomous sampler was 0.67. Applying this ratio to more widespread high-volume PM<sub>10</sub> data from the east-central US suggests that as many as 65 of 79 monitored counties (82%) may have difficulty meeting the annual average PM<sub>2.5</sub> NAAQS of 15 µg/m<sup>3</sup>.

In April 1997, TVA and Valley regulatory partners initiated a comprehensive prototype-Federal Reference Method PM<sub>2.5</sub> monitoring network to (1) estimate ambient concentrations of urban and rural PM<sub>2.5</sub>; (2) determine the relative contribution of major emissions source categories on Valley PM<sub>2.5</sub> using chemical mass balance models; and, (3) develop pedagogical capabilities in testing, applying, and interpreting current and emerging sampling, analysis, and modeling tools. Operation of the first three prototype-PM<sub>2.5</sub> samplers commenced in April 1997 in Nashville, Knoxville, and Lawrence County TN and, eventually six more stations were added in Chattanooga, Memphis, and Look Rock TN, Decatur and Huntsville AL, and Paducah KY. With more than 1450 samples collected to date, this effort represents the most comprehensive regional PM<sub>2.5</sub> monitoring effort in the eastern U.S. prior to the implementation of the EPA-supported national PM<sub>2.5</sub> compliance network. Results suggest that the annual NAAQS for PM<sub>2.5</sub> will be difficult to attain and that, unlike the PM<sub>10</sub>-based standards, attainment of the annual PM<sub>2.5</sub> standard could well be the exception rather than the rule in eastern U.S. urban areas. Seven out of nine stations exceeded the level of the annual PM<sub>2.5</sub> NAAQS for one or more annual period but only one measurement exceeded the 65 µg/m<sup>3</sup> level of the 24-hour PM<sub>2.5</sub> NAAQS. Temporal considerations suggest declining annual PM<sub>2.5</sub> concentrations during the last 20 years in keeping with declining PM<sub>10</sub> and TSP trends. There is insufficient evidence to suggest overall spatial trends other than an urban/rural dichotomy with urban areas experiencing 3 to 6 µg/m<sup>3</sup> higher PM<sub>2.5</sub> concentrations (on an annual basis) than nearby rural areas.